US ISSN 0010-1443

THE COLONIAL NEWSLETTER

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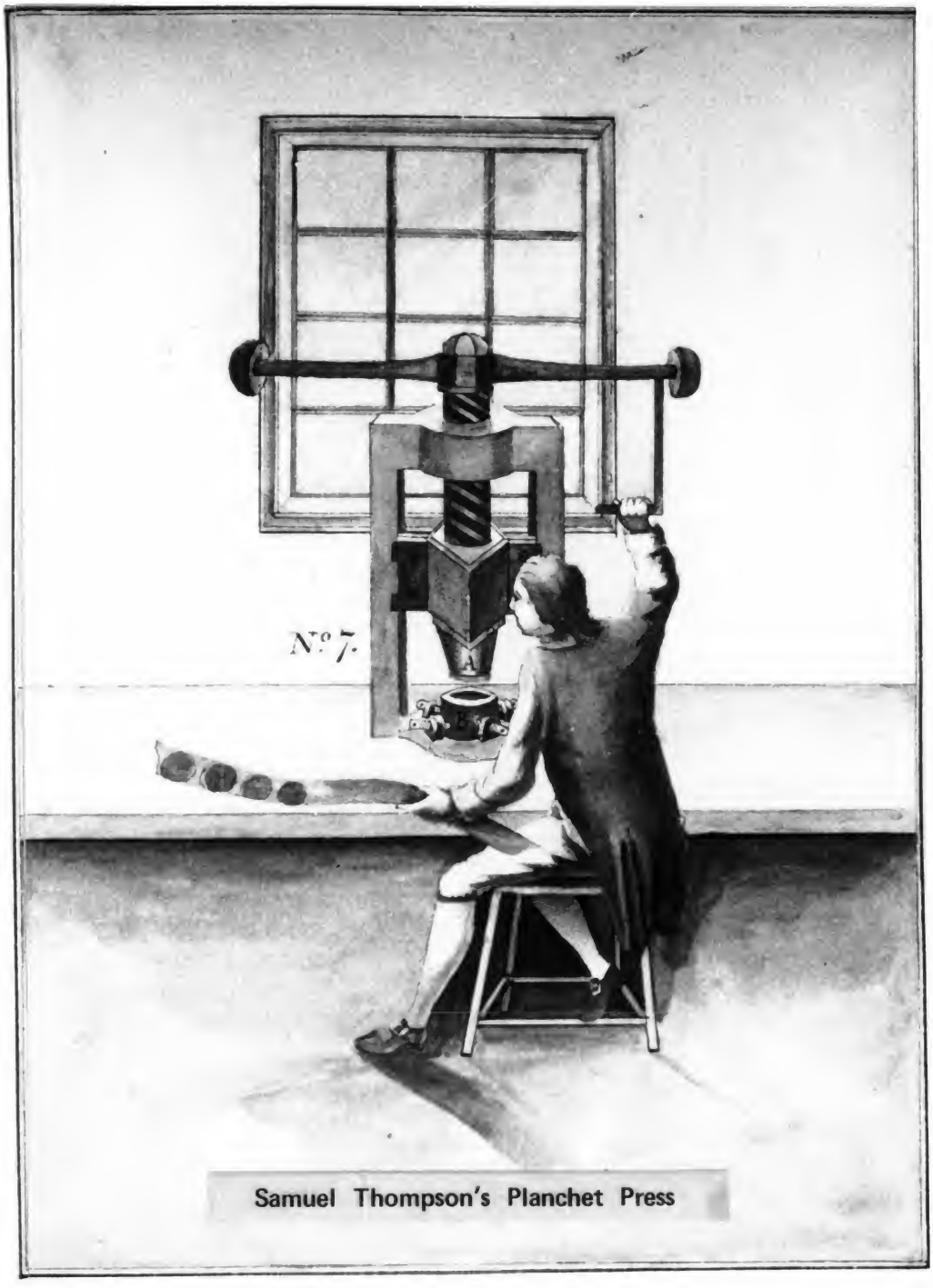
Volume 21, No. 2 July, 1982 Serial No. 63



Samuel Thompson's Planchet Press

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An Overview of Early American Coinage Technology

by J. C. Spilman

● The Coinage Press — Continued

In our previous issue (CNL No. 62, pps. 765-776) we discussed the general form of screw presses used for the production of coinage during the late 1700 era in America. Before we leave the subject of the large screw press, or Fly as it was then known, it is useful to discuss some of the evidence presented by the coinage itself regarding techniques for which no other data has been discovered. On page 773 we mentioned that automatic planchet feeders had been in use on presses at the first U.S.Mint and on Abel Buell's presses used for the Connecticut and Fugio coinages. The illustration of the Boulton Steam Modified Screw Press clearly shows that by the early to mid-1800 era screw presses were equipped with sophisticated planchet feeders operated by a sector mounted on the weighted fly arm. A container directly in front of the operator is filled with blank planchets and he is stacking then in short stacks which he will load into the feeder. The completed coins have been ejected into another container at the far right, well out of reach of the operator.

The screw presses at the first U.S.Mint also had some very "modern" accessories. George Escol Sellers[9] describes the operations at the first U.S.Mint as follows:

> The building used for the mint had very much the appearance of an ordinary three-story brick dwelling house of that period, the back building and yard extending on the alley. In a rear room, facing on the alley, with a large, low down window opening into it, a fly press stood, that is a screw-coining press mostly used for striking the old copper cents. Through this window the passersby in going up and down the alley could readily see the bare-armed vigorous men swinging the heavy end-weighted balanced lever that drove the screw with sufficient force so that by the momentum of the weighted ends this quick-threaded screw had the power to impress the blank and thus coin each piece. They could see the rebound or recoil of these end weights as they struck a heavy wooden spring beam, driving the lever back to the man that worked it; they could hear the clanking of the chain that checked it at the right point to prevent it striking the man, all framing a picture very likely to leave a lasting impression, and there are no doubt still living many in Philadelphia who can recollect from this brief notice of the first mint.
>
> One day in charge of my elder brother I stood on tip-toe with my nose resting on the iron bar placed across the open window of the coining room to keep out intruders, watching the men swing the levers of the

9 See page 798 for notes

> fly press; it must have been about noon, for Mr. Eckfeldt came into the room, watch in hand, and gave a signal to the men who stopped work. Seeing me peering over the bar, he took me by the arms and lifted me over it. Setting me down by the coining press he asked me if if I did not want to make a cent, at the same time stopping the men who had put on their jackets to leave the room. He put a blank planchet into my hand, showed me how to drop it in, and where to place my hand to catch it as it came out; the lever and weights were swung, and I caught the penny as we boys called cents, but I at once dropped it. Mr. Eckfeldt laughed and asked me why I dropped it?
>
> Because it was hot and I feared it would burn me. He picked it up and handed it to me, then certainly not hot enough to burn; he asked if it was not cold when he gave it to me to drop onto the press; he told me to look and see there was no fire, and feel the press that it was cold; he then told me I must keep the cent until I learned what made it hot; then I might, if I liked, spend it for candy.

These passages from the reminiscences of George Escol Sellers tell us several very important facts. First -- the the press was equipped with a spring loaded lever ro absorb the force and assist in reversing the swing of the weighted fly arms at the conclusion of the downward stroke of the dies, as well as heavy chains to restrain the arms on the return swing. Secondly -- there was a feeder device of some sort and an ejector to remove the struck planchet from between the dies, and thirdly -- a freshly minted copper cent was too hot to handle with bare hands! Even in the days of the first U.S.Mint the basic screw press had been significantly improved over early models for which we have sketches!

But -- what about Abel Buell's press used for the Connecticut and Fugio coinages? A perfectly struck coin on a fine planchet is a beauty to behold. Fortunately for our studies not all of the coppers of the 1785-1788 American era were perfectly struck, so we can turn to the coinage itself to observe the evidence and discover the techniques for which we have no written documentation.

Every mechanism devised by man has always demonstrated one common characteristic and that is a universal ability to malfunction! When a production device fails to operate properly it generally results in a product defect and repeated malfunctions produce a trend of defects that can exactly identify what evenrs occurred to destroy perfection in the product. Modern production quality control practice dictates that a defective product is rejected and does not go into distribution channels. There were, no doubt, serious attempts on the part of early American coiners to produce a quality product. These people, after all, were skilled craftsmen; they were gold and silversmiths, gunsmiths, millwrights and blacksmiths, and all had been trained under a strict apprentice system and took great personal pride in the quality of their work. Fortunately for us, however, a significant number of defective early American coins passed through their quality conrrol system (whatever it may have been) and have survived some two hundred years to tell us their stories today.

Up until this point in our Overview we have relied on photographs, sketches and written descriptions of coinage presses for the majority of our information and we shall continue to do so whenever such material is available, but from this point forward our discussion will center around the visually observable evidence presented by the coins themselves as we delve into the more obscure aspects of early American coinage technology.

We know of the automatic feeder on the Boulton Steam Fly and of George Sellers' observations on operations at the first U.S.Mint, but no such similar positive observations have come to light regarding the early American coinages presses of the 1785-1788 era. So -- let us now turn to the coins themselves and examine the defective products of these early American mints, coinage specimens long rejected by numismatists as unworthy of retention in their collections. Let us consider the coinage defects that might occur if an automatic planchet feeder were to malfunction, remembering that we have a situation where two or three men are vigorously working with a heavy fly press and concentrating on keeping the machine going at a maximum rate. Only in the event of a major malfunction would we expect these indivduals to stop the press. Minor coinage problems would be pushed aside and work would continue without interruption. Badly defective coins would be sorted out and discarded at some later time.

Automatic devices operated by the basic movements of machine parts first appeared on machines as early as the mid-1300's and their incorporation on the fly presses of the late-1700's is certainly not unexpected. A planchet feeder would likely be designed to hold a number of planchets, perhaps a stack or row of ten to twenty, and to feed them - one with each stroke of the press - to a position between the dies. At the same time, the previous planchet, fully struck as a coin, would somehow be shoved out of the way. The sort of malfunctions to be expected would be (1) failure to feed a new planchet with the result that the previous planchet would remain and be double struck, and we know of a lot of double struck specimens. (2) Failure to properly center the new planchet on the dies resulting in an an off-center strike, and we know of quite a few poorly centered specimens. (3) Failure to position a new planchet between the dies with a resulting die clash, and we know that this happened once in awhile, and (4) failure of the new planchet to fully push the previous strike out of the way, perhaps overlapping just a bit and resulting in a small pinched area on one or both of the specimens.

The first three of these defects could also be expected to occur with a hand fed press, but the fourth defect would probably not occur in a hand-fed situation, and yet there are a lot of pinched edge defects in existance today. Four typical pinched edge specimens are illustrated on page 784. In each of these four cases the coin was well centered and properly struck. Then, the blank planchet which should have pushed the struck coin out of the way failed to completely do so, instead riding over or perhaps sliding under the struck specimen. On the next stroke of the press the new planchet would, with application of die pressure, cause the struck

5.5-M of 1786

5.4-O.1 of 1786

31.1-gg of 1787

44-ii of 1787

CONNECTICUT

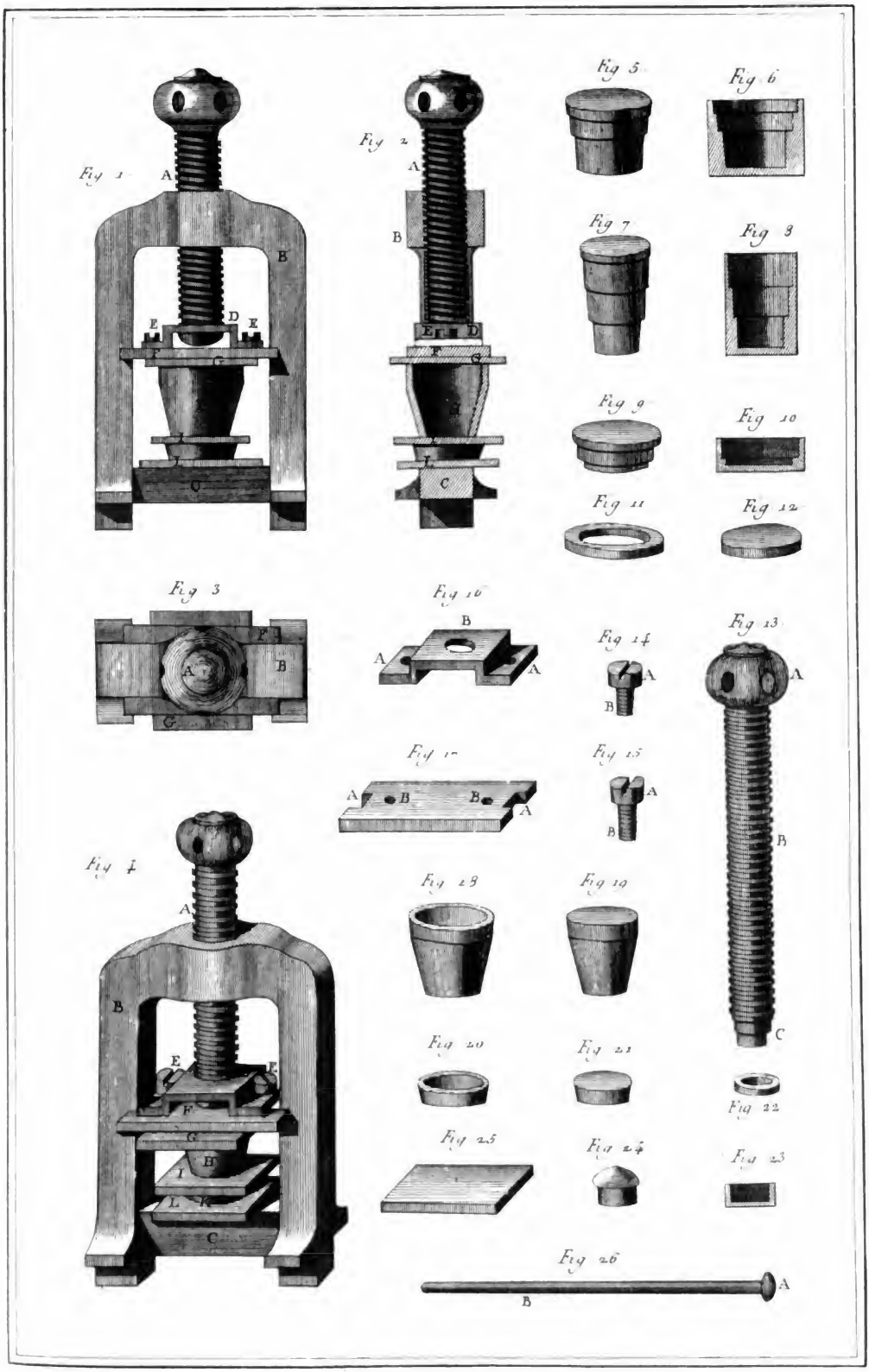
PINCHED EDGE EXAMPLES

specimen to be squeezed at the edge between a die and the new planchet. It is possible that a small edge pinch as exhibited by three of these specimens could result in the specimen being fired out of the press like a projectile and may have been a dangerous situation for the operators. The specimen with the larger overlap, approximately 25%, probably remained in the press and generated a partial brockage of the new planchet. Had the new planchet pushed fully over the old, a full brockage would have resulted, and we know of quite a few full brockage specimens. These very small edge pinch specimens are evidence in favor of the use of an automatic planchet feeder on the presses used for the 1785-1788 American coinage production.

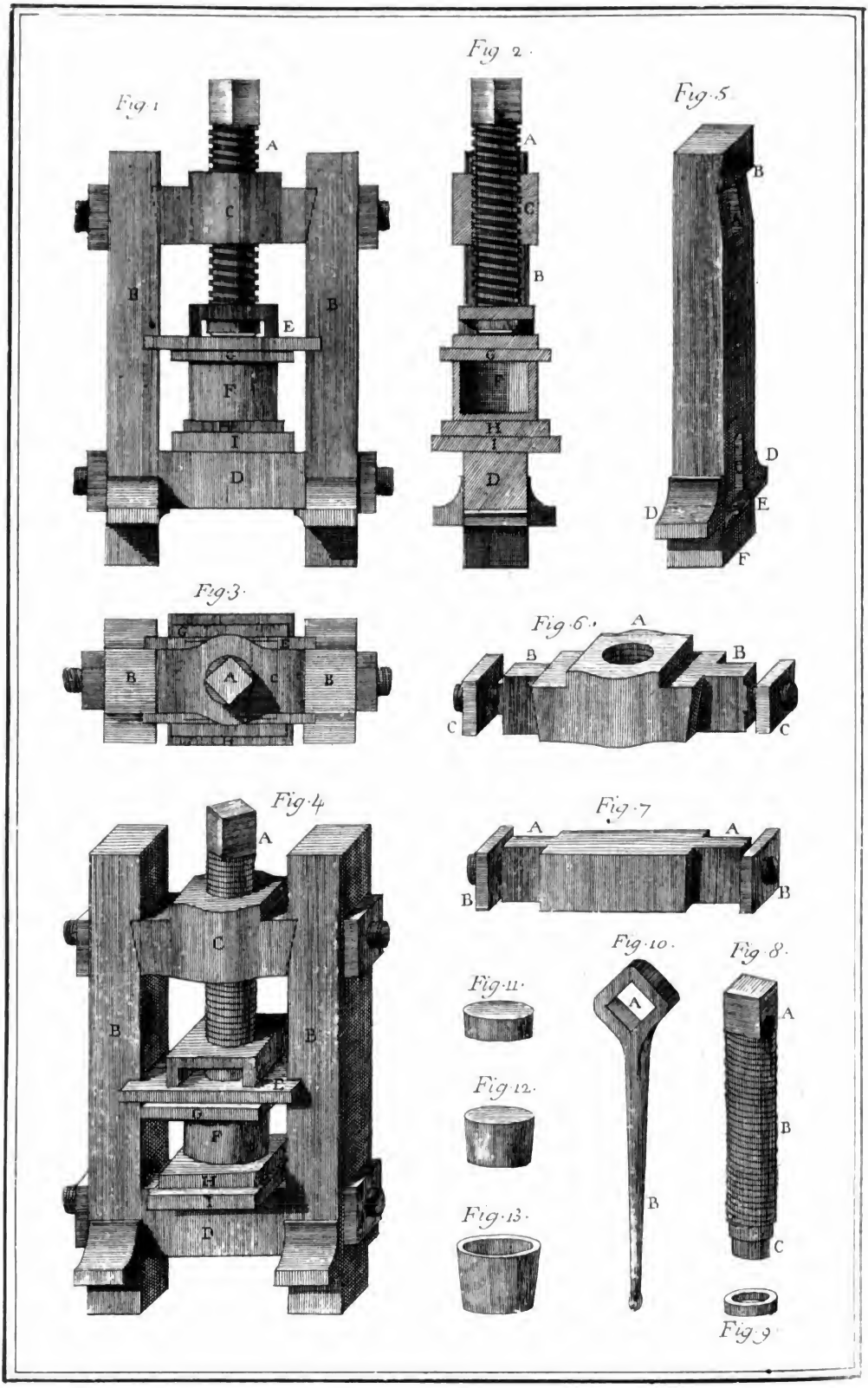
Before we go on to other coinage tools we should observe several smaller presses used in manufacturing processes of the mid-1700 era in order to compare construction techniques. Two such presses are illustrated on pages 786 and 787. Except for the absence of the large weighted arms these two presses taken from Diderot's Encyclopedia might be mistaken as coinage presses. These two machines were used in the manufacture of snuff boxes. There is no dimensional scale on either sketch but snuff boxes were generally an inch and a half in diameter to as much as three inches in diameter, more or less large coin sizes. These presses are identified as being used for the manufacture of "large" snuff boxes, and their lids, and "small" snuff boxes. Both presses have large vertical screws with left hand square threads. Unlike the fly presses these screws have slow threads having large mechanical advantage in order to apply very great pressure to the work piece.

In general, large presses having vertical metal screws were constructed with left hand threads of the square type while presses with large vertical wood screws were constructed with a left hand thread of the triangular type. On the other hand, smaller devices having horizontal threaded parts were generally constructed with right hand threads. As one might expect, these general conventions were not always followed and there are exceptions but whether these exceptions are factual or represent carelessness on the part of the person making sketches is unknown.

That a machine resembles a coinage screw press does not by any means determine that it was used for that purpose or even that it was sufficiently substantial for that use. For a number of years the United States Mint has exhibited a screw press at the Philadelphia Mint which is claimed to have been constructed by Adam Eckfeldt and used to strike half-cents and cents of 1793. This is a very small press, approximately thirty inches in height, and has a very checkered history. Supposedly sold for scrap by the mint and rebuilt by George B.Soley of Philadelphia who used it to produce small Lord's Prayer tokens at the Columbian Exposition it is uncertain today that the various parts are properly assembled. That it could have been used to strike half-cent and cent size copper coins is very doubtful.



Diderot's Press for Manufacture of Small Snuff Boxes



Diderot's Press for Manufacture of Large Snuff Boxes

The Planchet Cutter

Samual Thompson's planchet cutting press is illustrated on the frontispiece of this issue. This is a considerably smaller machine than the coinage Fly. It is table mounted and operated by a handle attached to the fly arm. The fast thread on the screw together with the limited reach of the operator indicates that only a quarter turn and perhaps even much less was required to cut a planchet from the strip of metal in the left hand of the operator.

Thompson had little to say of his planchet cutter in his Essay on Coining. He says only that to cut the planchets from a strip of copper " ... putting the strip between punch A and the bed B, then by turning the handle the large screw forces down the punch A, into the bed B and carries with it whatever is between. This operation will take two men, two days, with two presses, to cut two thousand." [10]

Not much detail can be determined from Thompson's illustration other than the punch A and bed B are secured in this small press in exactly the same manner as the coinage dies in the larger Fly. To learn what we can of planchet cutters used in America during the 1785-1788 era we must turn once more to the coinage itself and to those marvelous defective specimens that have survived.

Many examples of cutter marks exist in the early American series of coinages. Several examples are illustrated on page 789. There is one common and very significant characteristic in all of these markings -- regardless of the coinage series, Connecticut, Fugios, Machins, or whatever, they all appear to have been cut on exactly the same type of planchet cutter. This is a cutter that is similiar to a cookie cutter, in fact -- two telescoping cookie cutters -- with edges shaped exactly like those on an ordinary pair of scissors, except that they are formed into a circle.

Evidently quite a large quantity of early American planchets were miscut. That is - they were given a light blow with the cutters which did not cut through the material, and then another blow in a slightly different position. These planchets retained their markings of the first attempt even after they were coined. An especially good example of this miscutting is seen on the Connecticut 1.3-L of 1787 illustrated on page 789. Based on an analysis of these markings we devised, in 1973, an idealized model of what such an early American planchet cutting tool might look like. This model represents a device that could be manufactured with ordinary blacksmithing techniques and could be readily sharpened and maintained with use. This cutter model is illustrated on page 790. Below the model are sketches depicting the initial pattern in a planchet strip made by the edges of the cutting tool. Also shown are sketches of normal edge cuts and several types of defective edge cuts that resulted from tool wear and other defects.

Connecticut
1.3-L of 1787

Connecticut
37.4-k.1 of 1787

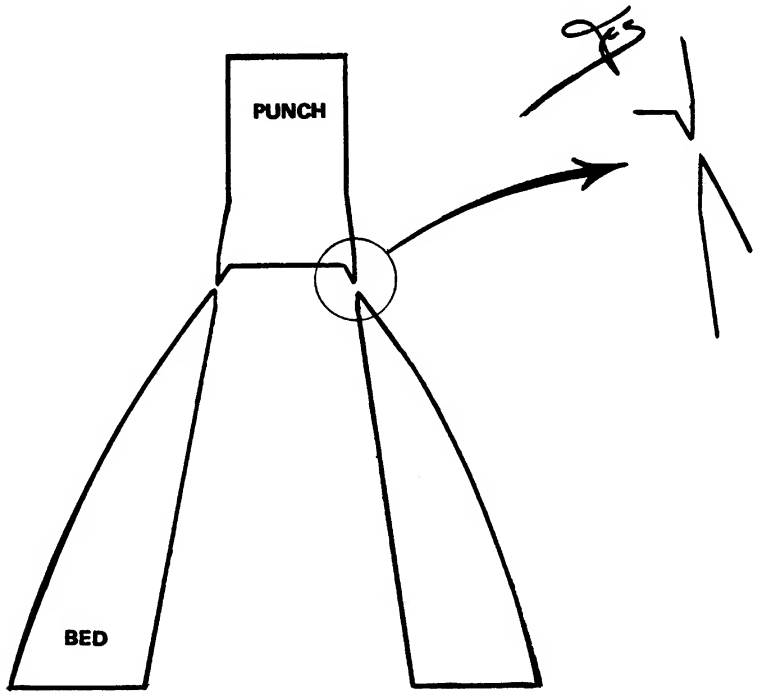
Connecticut
1.1-A of 1787

Fugio 20-R

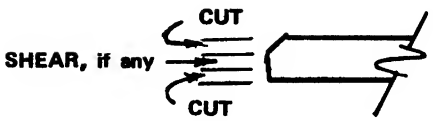
Fugio 8-B

Fugio 12-X

PLANCHET CUTTER MARKS



SECTION A–A



CROSS SECTIONAL SKETCH of CONCEPTUAL MODEL of EARLY AMERICAN PLANCHET CUTTING TOOL

WITH EDGE DETAILS

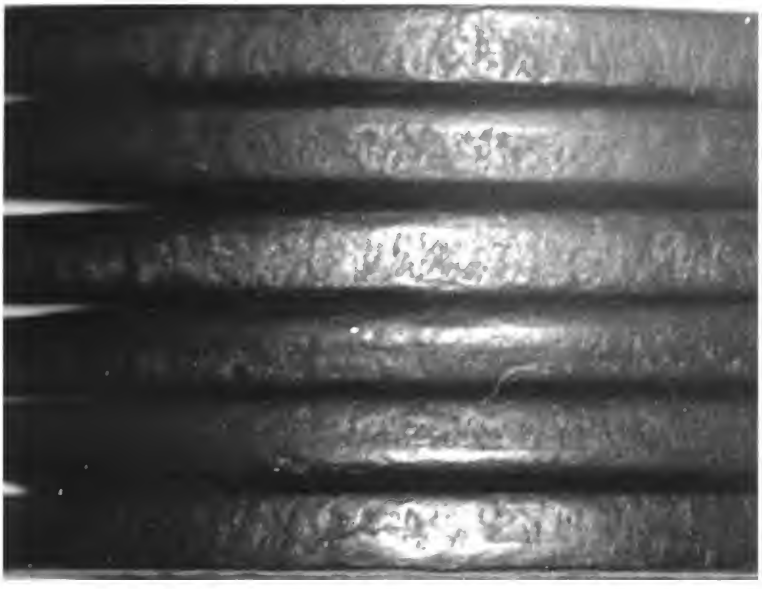
We know that this cutter performed one very important function in addition to simply producing a planchet. It produced a planchet having smooth rounded edges requiring no additional processing prior to stamping in the coinage press. This edge was quite different from the edges on British coinage of the same era.

The mechanism of the cutting action of our cutter model is also illustrated in the sketches on page 790. These cutters, working from both sides slice into the metal somewhat like a scissors blade. If properly accomplished, the cutters met at the center of the strip and telescoped within each other, resulting in a planchet having a very smooth rounded edge. If any shearing action occurred, and it generally did not, it was at a very thin section of metal directly at the center edge of the planchet. These idealized sketches indicate that a certain squareness should be evident on one of the two sides of the planchet, but this is generally not the case. Both sides of the planchet are equally rounded and this suggests that the punch portion of the cutter may have had a somewhat rounded interior so as to press the center of the planchet downward just before the cutter edges closed on the metal.

This cutting action was significantly different from that used in the manufacture of British planchets of the same era. The British planchets were apparently produced with a solid punch -- essentially a round rod pressing the planchet metal through a circular hole in a heavy base plate -- which, instead of making a smooth cut in the metal, produced a shear edge effect that is clearly evident in the photographs on page 792. The British planchets exhibit a square edge with rough shear patterns whereas the American style cutter produced planchets which exhibit a rounded edge with smooth cut patterns. Both type planchets were struck between dies without a collor and so retain their original edge patterns. Some small amount of distortion and expansion of the planchet occured during striking but not enough to significantly interfere in any way with the edge structure. [11]

The photographs on pages 792 & 793 show the edges of a number of near mint state coins of the late-1700 era. In the stack of British Regal halfpence are one specimen each dated 1770 through 1775. For comparison are two British made Virginia coppers dated 1773. Note that the edges of these are all identical and exhibit shear patterns across the entire width of each planchet.

Also shown are the edges of two stacks of near mint state Fugio Cents of 1787 and of Connecticut coppers of mixed dates for the years 1785, 1786 and 1787. Notice in particular the smooth rounded edges of the Fugios and Connecticuts as compared with the British coinages with their square sheared edge patterns. The need for a great amount of additional comparative study relative to other British coinages and American coinages is certainly indicated. These edge patterns may eventually serve to prove the origin of presently questionable specimens. [12]



EDGE PATTERNS on BRITISH REGAL HALFPENCE
One Specimen Each 1770 through 1775

EDGE PATTERNS on BRITISH MANUFACTURED
VIRGINIA COPPERS of 1773

EDGE PATTERNS on CONNECTICUT COPPERS of 1785 – 1788

EDGE PATTERNS on FUGIO CENTS of 1787

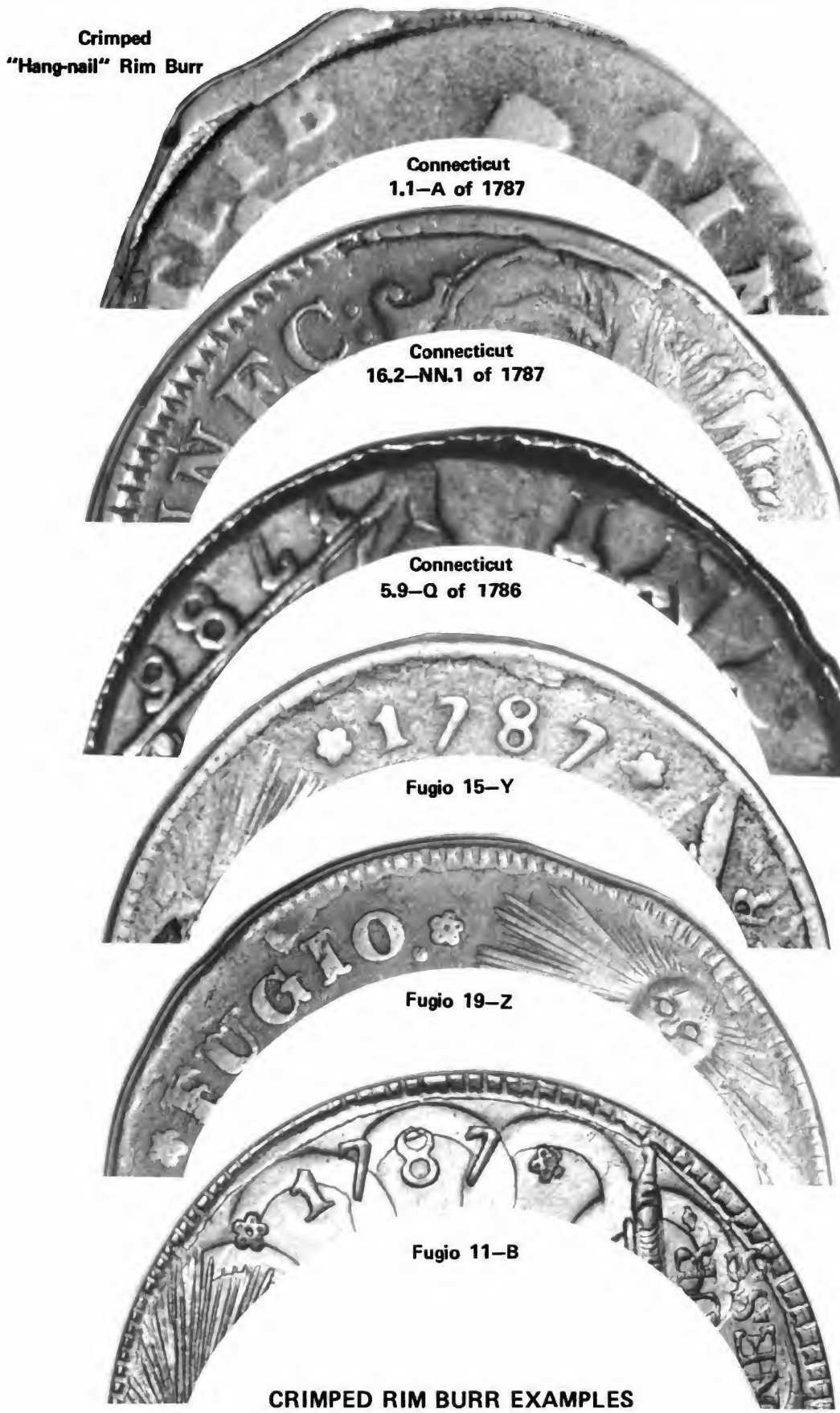
At times the telescoping scissors edge cutter malfunctioned and produced results that give us insight to the problems and operational techniques of this type cutter. If the cutting edges were not well sharpened or if permitted to wear an excessive amount, this cutter would begin to produce planchets having a slight burr on one side of an edge, generally not all the way around but usually only for a sector of some ten to ninety degrees around the circumference. This rim burr was just a minor problem and would be crimped down flat during coining resulting in a very characteristic effect on the struck coins. These crimped rim burrs are often seen on the Connecticut coinage. Several are illustrated on page 795. A very severe wearing of the cutter produced an effect we call tapered edges and even more severe wear or perhaps the breaking of a small portion of a cutting edge produced what we have called a hang-nail rim burr. A few of these severely defective planchets have survived to tell their story. Note especially the photograph of Connecticut 1.1-A of 1787.

Several years after developing these theories of planchet cutter configurations and the effects of wear and poor maintenance of this tool, it was exciting to discover an illustration in Diderot's L'Encyclopedie of a planchet cutting press utilizing a cutting tool almost exactly like our idealized model. This plate from Diderot is reproduced on page 796 and an enlarged portion of the press is shown on page 797.

Compare this device with the illustration of Samuel Thompson's planchet press. Unfortunately the Diderot illustration tells us almost nothing of the configuration of either cutting edge of the tool, but it certainly illustrates the validity of our stylized model. It will be interesting to someday construct this sort of cutter and experiment with it and attempt to duplicate the results obtained by our early American coiners.

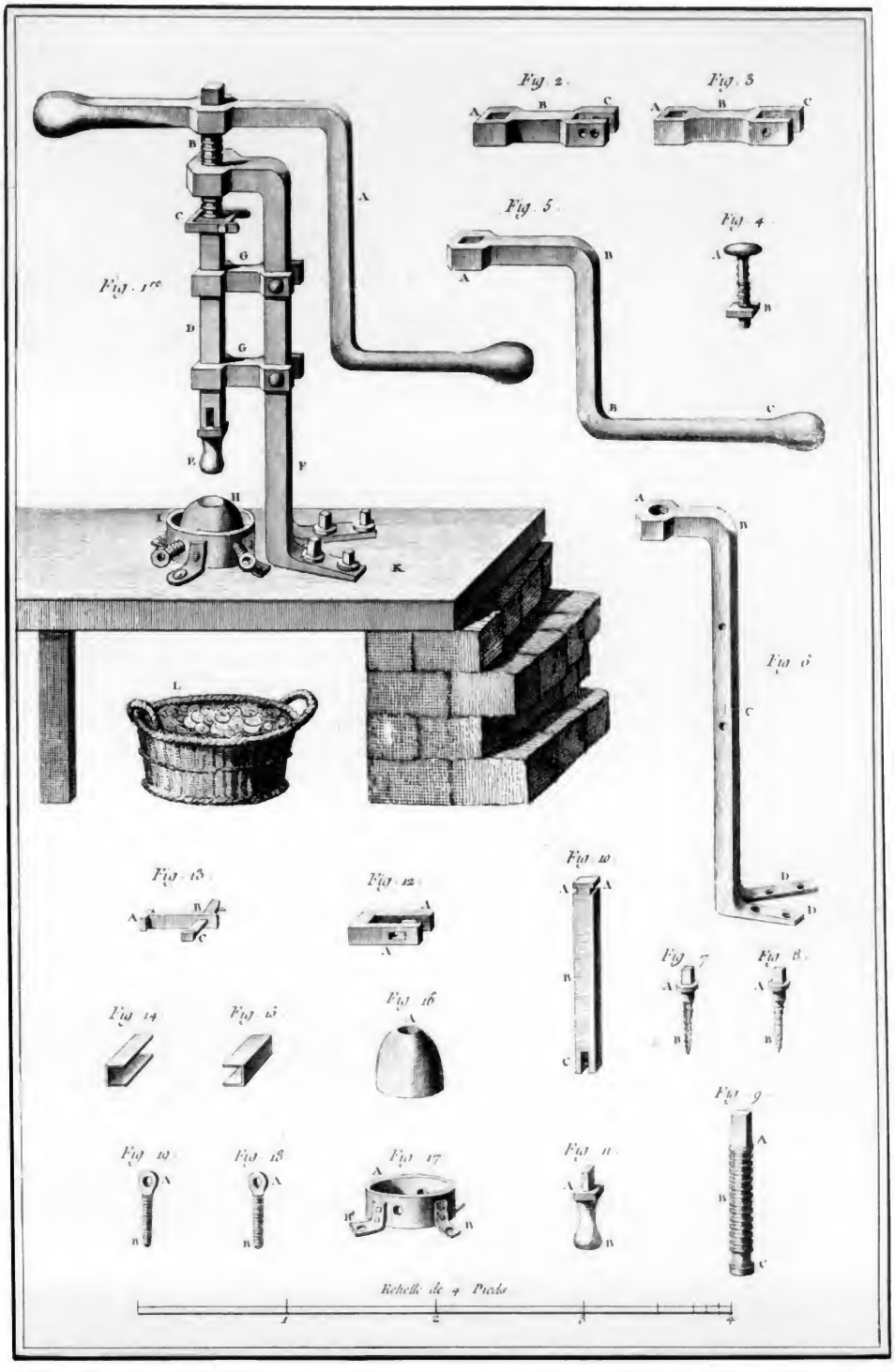
Our statements above notwithstanding, the smooth edges produced by these early American cutting tools were not entirely perfect. There are small imperfections that can be detected with the naked eye and felt with the fingers. It is possible and in fact rather easy to look at and to feel the edges of Connecticuts and Fugios and to positively establish various specimens that originated from the same planchet cutter. These markings are rather similar to those produced on a bullet fired from the rifled bore of a firearm.[13]

In our next Overview discussion we shall investigate the rollers and associated tooling used in the production of the metal strips from which planchets were cut and some of the details that have been uncovered regarding the manufacture of dies and hubs.

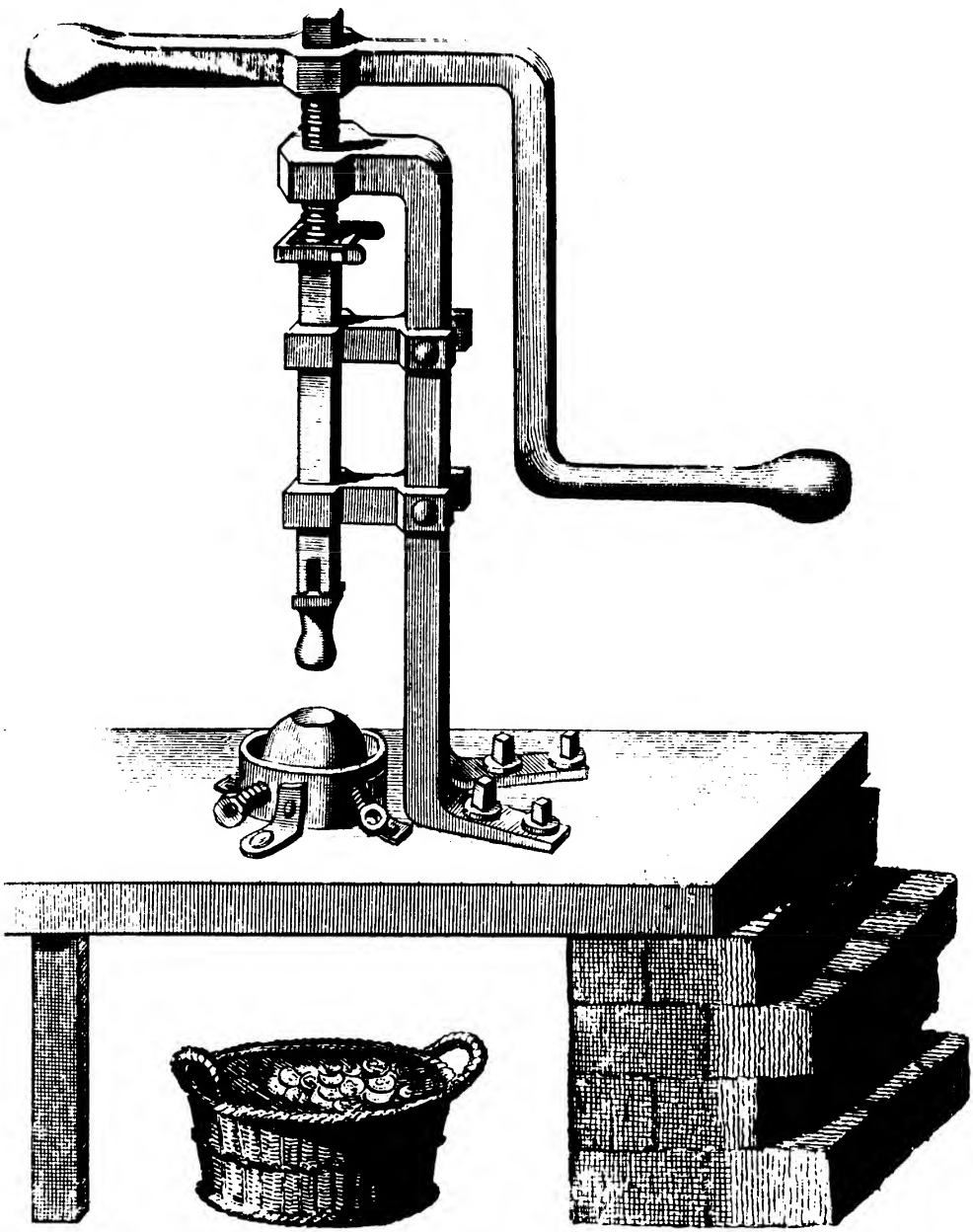


CRIMPED RIM BURR EXAMPLES

On Connecticut & Fugio Specimens



Diderot — PLANCHET CUTTING PRESS & COMPONENT PARTS



ENLARGED VIEW of DIDEROT'S PLANCHET PRESS

NOTES to An Overview of Early American Coinage Technology (Continued)

9. Early Engineering Reminiscences (1815-40) of George Escol Sellers. Edited by Eugene S. Ferguson. Museum of History and Technology; Smithsonian Institution, Washington, D.C. 1965. This book describes the development of machines and mechanical skills in the United States during the first half of the 19th century. Most of the narrative appeared in a series of articles in the American Machinist between 1884 and 1893. Additional episodes were culled from two unpublished volumes in the Peale-Sellers Collection of the American Philosophical Society Library. To those interested in the history of machines in early America and to the interrelationships of those most prominent mechanics of the time such as Adam Eckfeldt, Matthias W. Baldwin, Franklin Peale, Charles Gobrecht, Rufus Tyler, William Mason, Stephen Morris, and others, this volume is indispensable.

10. This works out to 500 planchets a day for each man. If we assume a 12 hour work cycle each day the production rate was about 42 planchets per hour, or less that one per minute. Planchet cutting was a slow process.

11. We have examined closely only the British regal halfpence of 1771 through 1775 and the Virginia coinage. The American coinages include the Fugios, Connecticuts and Machins Mills issues. Other issues deserve close examination as well, especially British tokens of the era and the Nova's, as well as New Jersey cents and half cents, Vermont coppers, and the New York issues. Near mint state condition is needed to be certain that edge damage effects are minimal. We request that our Patrons having such specimens examine their specimens and advise us of their findings.

12. It is generally believed that the rounded edge effect is a result of striking pressure; however, examination of specimens struck well off center indicate that this is not the case.

13. Forensic scientists identify bullets fired from a gun by comparing markings on the bullets produced during travel down the gun barrel. Similiar markings are produced on the edges of planchets cut on a telescoping planchet cutter and it is relatively easy to compare planchets and identify coins that originated from the same cutter.